Safety Clauses

In the process of using the soft starter, please note the following Safety Clauses

⚠ Please check this user manual carefully before using the product.

⚠ Only the technical person is allowed to install the product.

⚠To be sure that the motor is correctly matched with the soft starter.

⚠It is forbid to connect capacitors to the output terminals (U V W).

⚠Please seal the terminal switch insulation glue after finishing connect them.

⚠The soft starter and its enclosures must be fixedly earthed.

⚠During the maintenance and repair, the input must be off-power.

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1. The General of HSS Series Soft Starter

HSS series soft starter is new type start-up equipment which integrates electric force and electronic techniques computer technique and modern control theory. It is the new generation product to replace the conventional star-delta starter, self-coupling voltage-drop starter and magnetic control voltage-drop starter.

1.1 The main function

- This motor soft starter can reduce the starting current of motor and the power-distribution capacity to motor effectively, so it could save the cost.
- It can reduce the starting current of motor and other loading equipments, so that lengthen their service life.
- The function of soft stopping can solve effectively the surging problem of inertia system when stopping. The conventional motor starting equipments cannot realize it.
- The perfect and reliable protection features, can give the effective protection to the operator's safety as well as the motor and matched equipments.
- The application of intelligent and network technique make the HSSG3 type soft starter meet the high-speed development of electrical force automated technique effectively.

1.2 The main characteristics

Perfect design

Pretty external shape and structure, perfect and unique functions, simple and reliable operation, every technological is made in the best design.

Reliable and high-grade quality

This product is designed according to the computer analog test, has the best electromagnetic compatibility. It is proved high quality by the high-temperature ageing test and jigging test which done before the products out of factory.

Complete and perfect protection functions

Such as low voltage protection, failure voltage protection, over voltage protection, motor overheat or starting overtime protection, input or output failure phase and three-phase unbalanced protection, over current, over load and short current protection.

Having the self decision-making intellectual property of the product

Including exterior designing patent, decision-making software copyright, the starting and protection techniques of motor, and the technology of detecting and debugging

The best service

The reliable function and quality is the basic of the best service. Even more, we can supply the special designing and functions of product matched to your need and the timely and perfect usage consulting service.

1.3Technical specification

Item		Description
Input Power Supply	Input Voltage	Three-phase 220V/380V/480V AC
	Frequency	50/60Hz
Adaptive Motor		Squirrel-cage three-phase asynchronous motor
Starting Times		It is recommended not to exceed 20 times per hour.
Control Mode		(1) Operation panel control; (2) Operation panel + external control; (3) External control; (4) External control + COM control; (5) Operation panel + external + COM control; (6) Operation panel + COM control; (7) COM control; (8) No start or stop operation.
Start Mode		(1) Current-limiting start; (2) Voltage ramp start; (3) Kick start+ current-limiting start; (4) Kick start + voltage ramp start; (5) Current ramp start; (6) Voltage current-limiting double closed-loop start.
Stop Mode		(1) Soft stop; (2) Free stop.
Protective Function		(1)Open loop protection for external instantaneous stop terminals; (2) Over-heat protection for soft starter; (3) Protection for too long starting time; (4) Input open phase protection; (5) Output open phase protection; (6) Unbalanced three-phase protection; (7) starting over current protection; (8) Running overload protection; (9) Under voltage protection for power voltage; (10) Overvoltage protection for power voltage; (11)Protection for fault parameter setting; (12) Load short circuit protection; (13) Auto restart or incorrect wiring protection; (14)Incorrect wiring protection of external control stop terminals.
Ambient	Place to be used	Indoor location with good ventilation free from corrosive gas and conductive dust.
	Altitude	Below 3000M. It have to rise the rate power when the altitude is more than 3000M.
	Temperature	-30 +55°C
	Humidity	90%RH without dew condensation.
	Vibration	<0.5G
Structure	Protection Class	IP20
	Cooling Pattern	Natural wind cooling.

2. Code Explanation and Inspection

2.1 Nameplate explanation

Please check up the products before using, if in some problems; please do not hesitate to contact us with any request for additional information. Check-up the type of productwhether it is the right one you order.

- Check any damage to the product because of the transport, such as the spare parts are apart from the main body or the shell be damage etc.
- Check others, including the certificate of soundness, and the user manual.

2.2 HSS series soft starter explanation

Nameplate explanation:

Diagram 2.1

Model explanation:

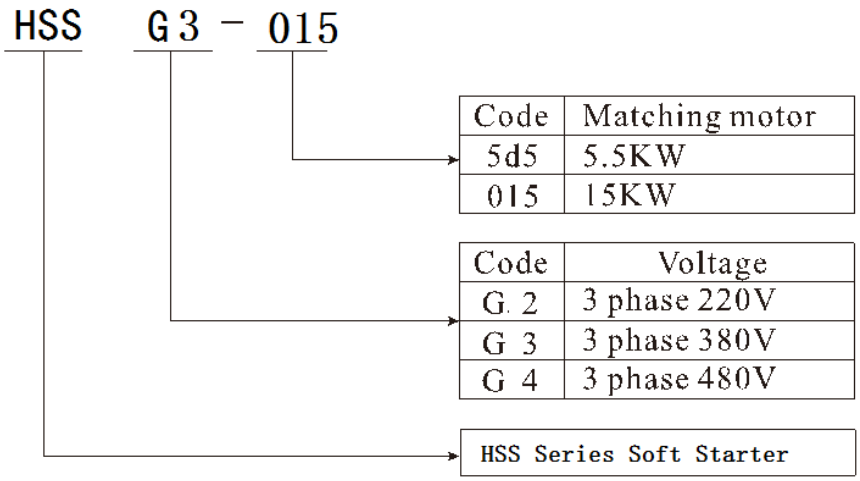


Diagram 2.2

Outline of the soft starter:

Diagram 2.3

3. Usage Condition and Installation Requirement

It is strict rule for the users to use or install the soft starter according to the requirement; otherwise, it will be in bad result.

3.1 The usage condition

Power Supply:City grid power, self-provided power, diesel oil dynamotor, 3-phase alternating current 220V/380V/480V±15%, 50Hz or 60Hz.The power capacity of the soft start must meet the motor starting requirement.

Matched Motor: Motor should be three phase squirrel asynchronous motor, and its power capacity mustbe matched with soft starters.

Starting Frequency: The starting time is according to the loading equipments.

Cooling Mode: Naturally wind cooling.

Protective Grade: IP20

Environment Conditions: when altitude is less than 2000m, the temperature of the environment should be between -25°C ~ 40 °C, relative humidity should be less than 90%, no vapor, no flammable, volatile, corrosive gas. No electric dirt, indoor installation, ventilated, vibration is less 0.5G. Note: Over more, we can manufacture other type soft starters which are used in special conditions, such as explosion-proof type soft starter, low-temperature type soft starter, or high-voltage type soft starter.

3.2 The installation requirement

- The direction and distance of installation: In order to make sure that the soft starter be in good ventilation and heat dissipation, please install the product in vertical direction, and be sure the space around the product is enough..(See the following diagram 3.1)
- If the soft starter is installed in a box, please note that the ventilation is very good, as well as the above notes. (See the following diagram 3.1)

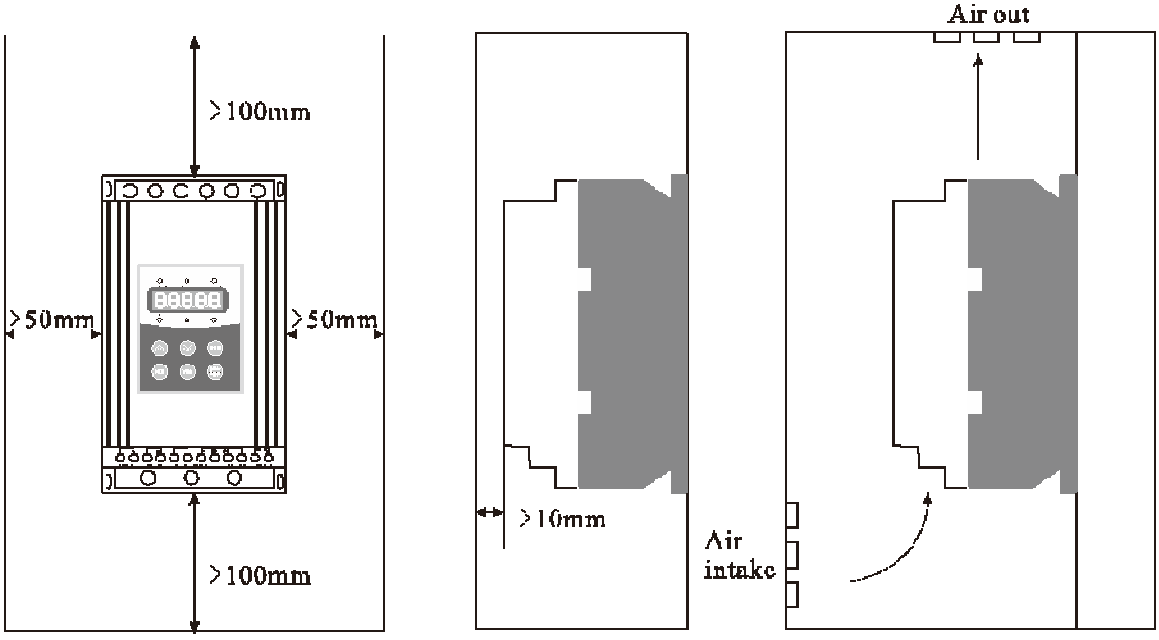


Diagram 3.1

3.3 The installation dimensions

The external shape and installation dimensions of 5.5KW ~ 75KW (Diagram 3.2)

Model			Power (KW)	Current (A)	External dimensions (mm)			Installationdimensions (mm)			N.W (KG)
220V	380V	480V			W1	H1	D	W2	H2	d	
---	HSSG3-5d5	HSS4-5d5	5.5	11	146	270	160	131	247	M6	<5
---	HSSG3-7d5	HSS4-7d5	7.5	15	146	270	160	131	247	M6	<5
HSS2-5d5	HSSG3-011	HSS4-011	11	22	146	270	160	131	247	M6	<5
HSS2-7d5	HSSG3-015	HSS4-015	15	30	146	270	160	131	247	M6	<5
---	HSSG3-018	HSS4-018	18.5	37	146	270	160	131	247	M6	<5
HSS2-011	HSSG3-022	HSS4-022	22	43	146	270	160	131	247	M6	<5
HSS2-015	HSSG3-030	HSS4-030	30	60	146	270	160	131	247	M6	<5
HSS2-018	HSSG3-037	HSS4-037	37	75	146	270	160	131	247	M6	<5
HSS2-022	HSSG3-045	HSS4-045	45	90	146	270	160	131	247	M6	<5
HSS2-030	HSSG3-055	HSS4-055	55	110	146	270	160	131	247	M6	<5
HSS2-037	HSSG3-075	HSS4-075	75	150	146	270	160	131	247	M6	<5

Note: The rated power of motor in the above form is the maximum rated value. Generally, the values of matched motor power capacity should not be more than this value.

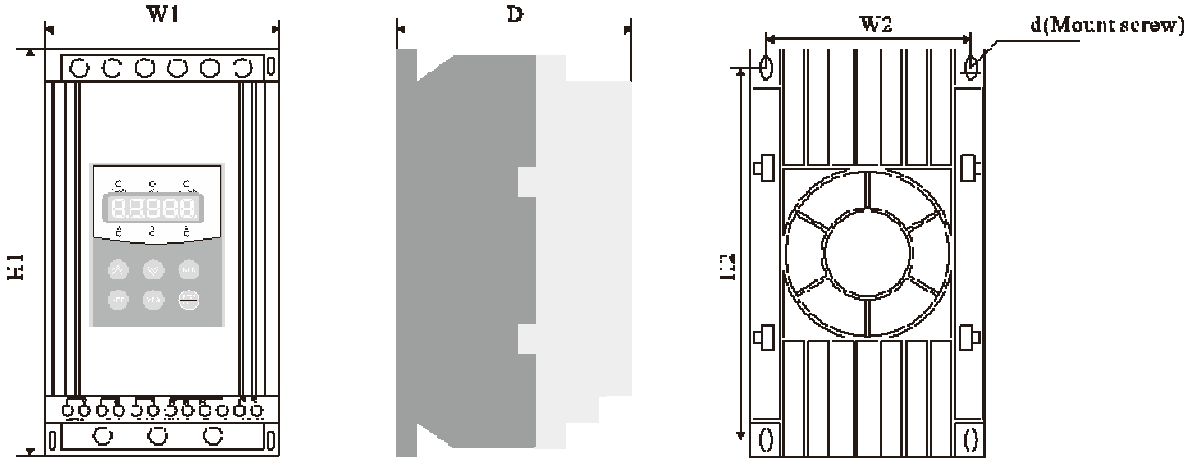


Diagram 3.2

The external shape and installation dimensions of 90KW ~ 600KW (Diagram 3.3)

Model			Power (KW)	Current (A)	External dimensions (mm)			Installationdimensions (mm)			N.W (KG)
220V	380V	480V			W1	H1	D	W2	H2	d	
HSS2-045	HSSG3-090	HSS4-090	90	180	257	525	194	195	377	M8	<21
HSS2-055	HSSG3-115	HSS4-115	115	230	257	525	194	195	377	M8	<21
---	HSSG3-132	HSS4-132	132	264	257	525	194	195	377	M8	<21
HSS2-075	HSSG3-160	HSS4-160	160	320	257	525	194	195	377	M8	<21
HSS2-090	HSSG3-185	HSS4-185	185	370	257	525	194	195	377	M8	<21
HSS2-100	HSSG3-200	HSS4-200	200	400	257	525	194	195	377	M8	<21
HSS2-132	HSSG3-250	HSS4-250	250	500	290	560	245	260	465	M8	<25
HSS2-160	HSSG3-280	HSS4-280	280	560	290	560	245	260	465	M8	<25
HSS2-185	HSSG3-320	HSS4-320	320	640	290	560	245	260	465	M8	<25

Model			Power (KW)	Current (A)	External dimensions (mm)			Installationdimensions (mm)			N.W (KG)
220V	380V	480V			W1	H1	D	W2	H2	d	
HSS2-200	HSSG3-400	HSS4-400	400	800	330	590	245	300	490	M8	<32
HSS2-220	HSSG3-450	HSS4-450	450	900	330	590	245	300	490	M8	<32
HSS2-250	HSSG3-500	HSS4-500	500	1000	450	740	300	400	575	M10	<40
HSS2-315	HSSG3-600	HSS4-600	600	1200	450	740	300	400	575	M10	<40

Note: The rated power of motor in the above form is the maximum rated value. Generally, the values of matched motor power capacity should not be more than this value.

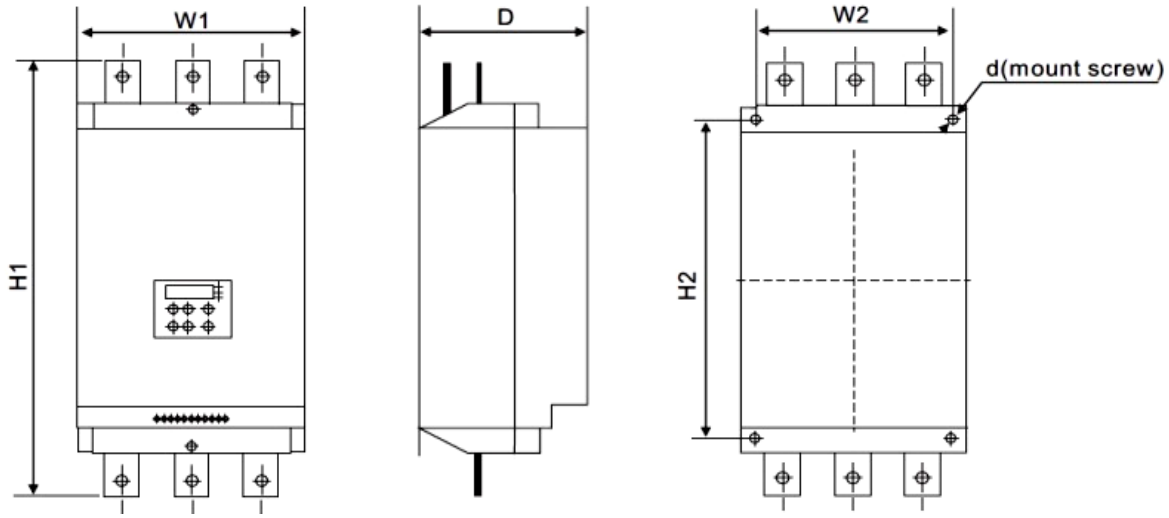


Diagram 3.3

4. Connection and External Terminal

The HSSG3 soft starter has three types of connection as following:
Main circuit connection: It contains the wiring of 3-phase source input, the output to motor, and the pass -by contactor connection.
External terminal connection: that is the wire comes from twelve external terminals which including control signal and analogue output signal.

4.1 The diagram connection

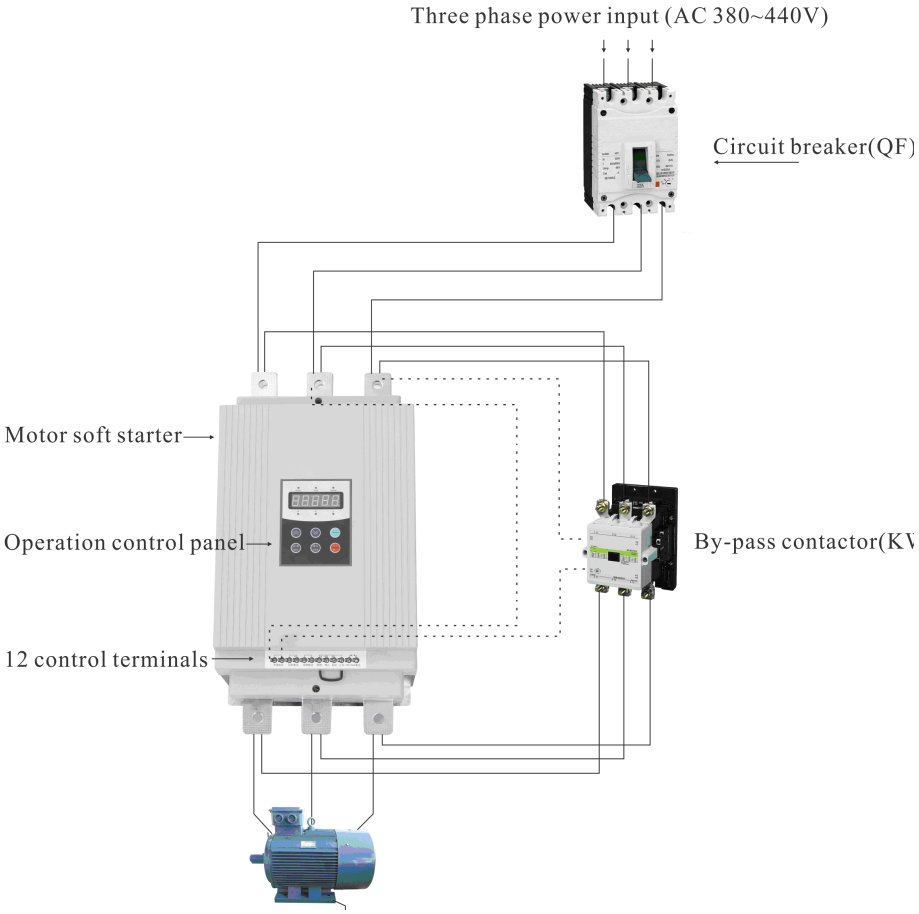


Diagram 4.1

4.2 The external terminal

Please see the diagram 4.2

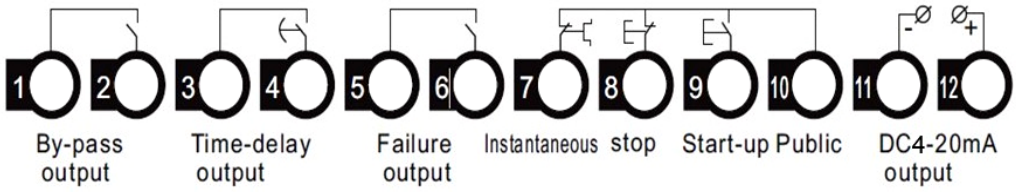


Diagram 4.2

- Terminal ①② are by-pass output, are used to control the by-pass contactor. They are normal open contacts and are closed when finishing starting. The terminal contact capacity is AC 250V/5A.
- Terminal ③④ are programmable relay output: The delay time is set by **F4** code. The output command

type is set by **FE** code. They are normal open no-power terminals, being close when output valid. Please see the detailed information in item 5.3. This terminal contact capacity is AC250V/5A.

- Terminal ⑤⑥ are fault output , they will be closed when there are any fault matters happened to the soft starter or electricity lost, while at normal case they are open. This terminal contact Capacity is AC250V/0.5A.
- Terminal ⑦ are instantaneous stop input, this terminal must be connected with terminal ⑩ when the starter works normally. But if these two terminals are open, the soft starter will stop, and at this time the starter is at the state of fault protection. This terminal ⑦ can be controlled by the normally closed output terminals of external protection device, and it is useless when the **FA** code is set to 0(basic protection).

Terminal ⑧⑨⑩ are startup or stop input .There are two ways of connections for your selection; those are 3-wire connection and 2-wire connection. Please see the diagram 4.3

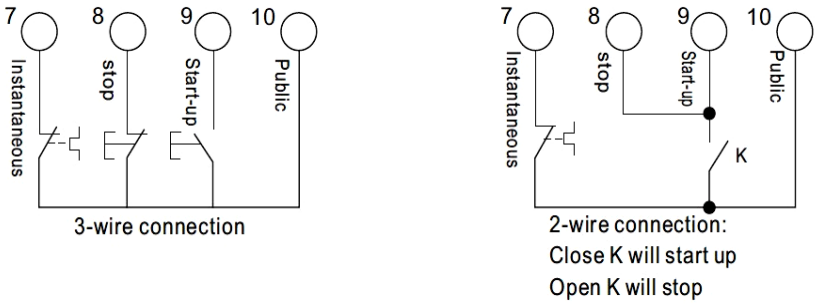


Diagram 4.3

- Terminal ⑪⑫ are DC 4 ~ 20mA analogue output ,they indicate the current value of motor at real-time working. The 20mA is full-scale value and that is four times than rated current of nominal power of soft starter, while, we can connect a 4 ~ 20mADC current meter to check. The max value of output load resistance is 30Ω.

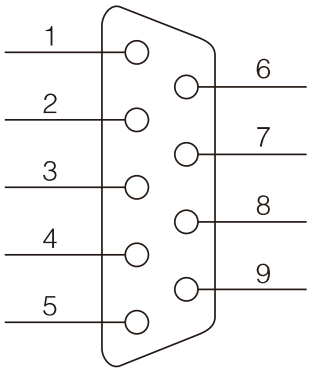
Note: Please make sure that external terminals are in right connection; otherwise, the product may be damaged.

4.3 The communication interfaces

RJ-45 is the standard web line socket.

DB9 socket has RS485 and RS232 interfaces inside.

Please see the diagram 4.4



①is RS485+
⑥ is RS485-
② is RS232 output.
③ is RS232 input.
④ is +5V output (limit-current is 50mA)
⑤ is earthed GND.
⑦⑧⑨ are empty.

Diagram 4.4

The user can choose the following software:

- Computer collector distribution control communication software.
- Device Net interface card and communication.
- Device Net/Mod-bus/Profi-bus gateways.
- Others.

4.4 The diagram of main circuit connection

Please see the diagram 4.4

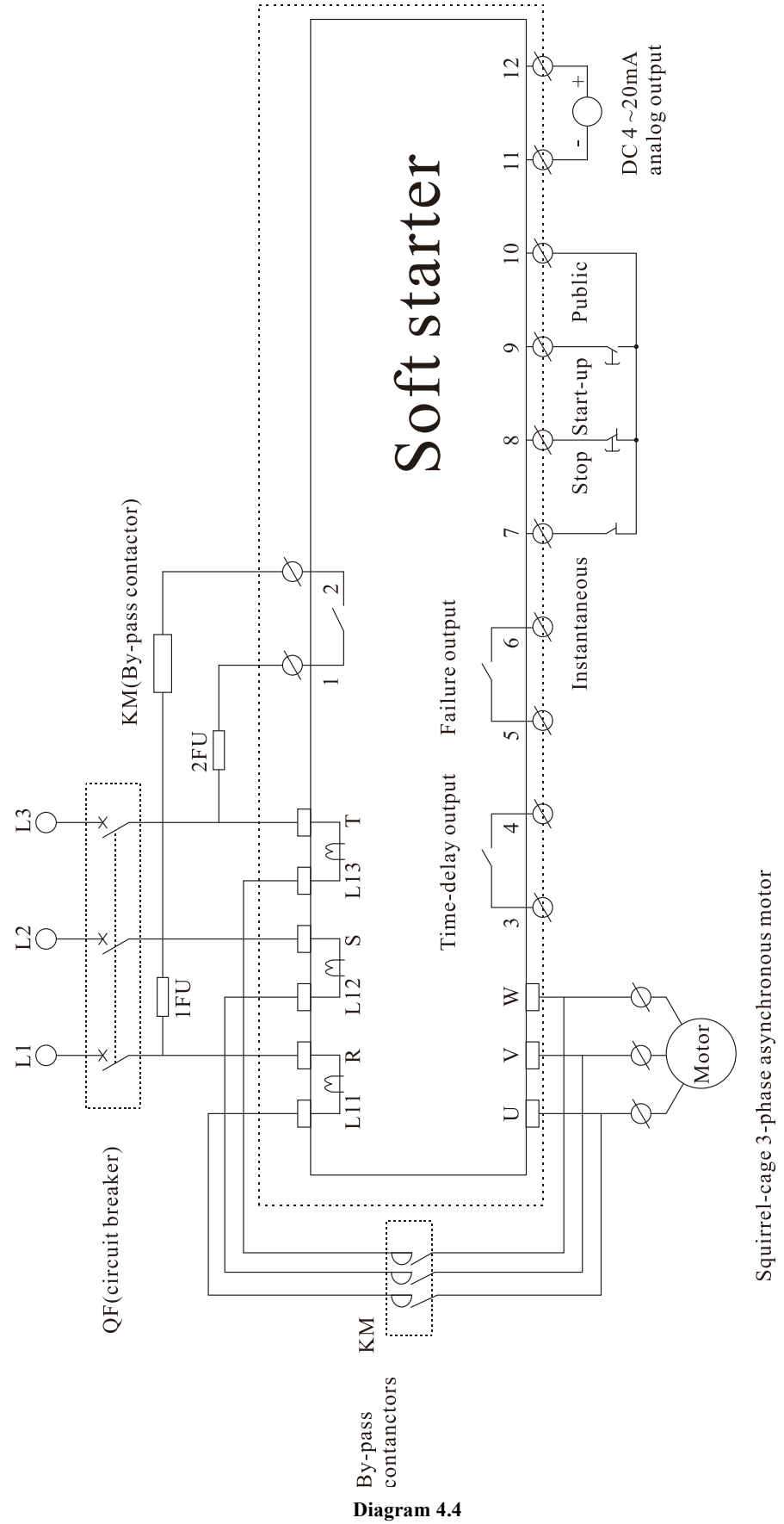


Diagram 4.4

5. Control Panel and Its Operation

HSS series soft starters have five working states, those are: Ready, Run, Fault, Start and Stop. The control panel will show the current vault of motor when in the process of start or stop, and it will show the set and help menu at other states.

5.1 The operation of control panel

Please see the diagram 5.1

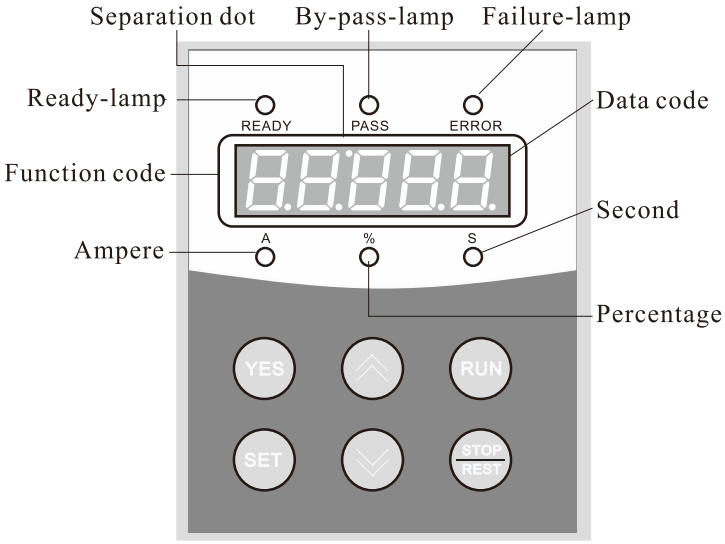


Diagram 5.1

- Open state: Please do not press the "RUN" key until the ready-lamp lights and show "READY"
- Time-delay state: When the ready-lamp or fault-lamp is shining, it means it is interval time delay; and when the display screen shows "dEXXX" and count down, that means staring time-delay.
- The "RUN" or "STOP" key: In the process of staring, the panel shows "XXXX" that is the value of start-up current .At this time only "STOP" key is valid. And the lamps of Ready, Run and Error are all dark, and you can't come into the "set" and "help menu" state. While, in the process of stopping, the panel shows "XXXX" that is the value of motor current. At this time, only "RUN" key is valid, and the lamps of Ready, Run and Error are all dark, and you can't come into the "set" and "help menu" state. The "STOP" key also has reset function.
- The "SET" key: Press "SET" key to enter the Set Menu and panel shows FX: X X X. Please press "Set" key again and Colon is shining, then you can change the parameters after the colon you need. If you want to save the parameter change, please press "YES" key. If you do not want to save, please press the "SET" key until the colon stops shining, then the parameters recover. Having finished the above operation, please press the "YES" key to exit or press "Stop" key to exit directly.
- The "YES" key: Under non-Set State, press the "YES" key to enter Help Menu and the panel shows HX: XXX. When you finish reading the Help Menu, you can press "YES" key again or "Stop" key to exit. Under Set State, This key can save parameters, and press again can exit set state.
- The "Up"(⏫) and "Down(⏬) key: In Set Menu, when the colon is not shining, you can press these two keys to select the Function Code; When colon is shining, you can press these two keys to change parameters. It is the same as the operation in Help Menu. When the Pass-by -lamp is lighting and the display Screen shows AXXX which means the operation current value of motor, now you can press "Up" or "Down" key and the screen will display PXXXX or HXXXX. (P X XXX means the apparent power of motor; HXXXX means the over-load heat balance coefficient, if this value is more than 100%,the screen

shows"Err08",that means soft starter is at state of over-load protection.)

Note:

- Only the operation is valid, soft starter will be with the voice when pressing the key. Otherwise, the operation is invalid.
- The control panel uses the super anti-interference material, so keypad cable can be external connection 3 meters away.
- Using "3-wire connection", the external start and stop button are same function as keypad "RUN" and "STOP".

5.2 Parameters set and explanation

The explanation for "Parameter-set"codes

Code	Explanation forcodes	The rangeof value	Ex-factory value	Special explanation
F0	Initial voltage	30 ~ 70%	30%	This code can be used when thestarting mode is set as "Voltage ramp to start", and if is "Limit-current" mode ,the value will be fixed as 40%
F1	Soft startingtime	2 ~ 60S	16S	It is invalid in "Limit-Current" starting mode.
F2	Soft stoppingtime	0 ~ 60S	0S	If the code set as "0", themotor will free stop. One soft starter for 2 motor, this code should set "0".
F3	Start-up time delay	0 ~ 999S	0S	Delay is with countdown mode; If set as "0", the starter will start up the motor immediately.
F4*	Programming time-delay	0 ~ 999S	0S	This code isused to set delay time of ③&④terminals output. Set "0"immediately close.
F5	Start-upcurrent limited value	50 ~ 500%	400%	It is used when the staring mode is "current limit", and the value will be fixed as 400% when the starting mode is "Voltage ramp to start"
F6*	Maximumcurrent ofsoft starter	50 ~ 200%	100%	The "50 ~ 200%" is basic on thenominal current of motor. If the set value of this code over 200%,the soft starter will reverse to overheat protection
F7	Lower voltageprotection	40 ~ 90%	80%	When the working voltage is underthe voltage range(80%),the soft starter will be low voltage protection
F8	Over voltageprotection	100~130%	120%	When the working voltage is overthe voltage range(120%),the soft starter will be over voltage protection
F9	Modes of starting	0 ~ 5	1	0: Limit-current to start 1: Voltage ramp start 2: Torque control + limit current 3: Torque control + voltage ramp 4: Current ramp start 5: Double closed loop

Code	Explanation forcodes	The rangeof value	Ex-factoryv alue	Special explanation
FA	Protection Level	0 ~ 4	4	0: Primary level; 1: Light load; 2: Standard load; 3: Heavy load; 4: Super level
Fb	Operation control mode	0 ~6	1	0: Run by keypad 1: Run by keypad and terminal 2: Run by terminal 3: Run by terminal and RS485 4: Run by keypad, terminal and RS485 5: Run by keypad and RS485 6: Run by RS485
FC	Parameter revise	0 ~ 2	1	0: Parameter revise prohibit; 1: Partial parameter revise prohibit; 2: All parameter allow revising.
Fd*	Communicatio naddress	0 ~ 63	0	Many soft starters connect with uppercomputer.
FE*	Programming output	0 ~ 19	7	Set the detailed in Item 5.3
FF*	Soft-stopping limited current	20 ~ 100%	80%	Set the detailed in Item 7.3
FP	Motor rated current		Rated value	"The rated current of motor"is the same as the motor nominalcurrent.
FU	Motor less loadprotection	0-99	Prohibit	Set the detailed in Item 5.3

Note:

- F6 the "Max working current", is basic on the nominal current of motor.
- If you have no any operation for 2 minutes after you come into the "set" state, soft starter will exit from "set" state.
- You can not set any parameters in the process of starting or stopping.
- If you press the "YES" key to power on soft starter, all parameters will recover to factory setting except FE code.
- When FC=1, these parameters with "*" is prohibited to revise.

5.3 Parameters code function explanation

The parameter "**Fb**"is used to set the control ways of soft starter; as the following form:

Numerical value	0	1	2	3	4	5	6
Keypad	1	1	0	0	1	1	0
External terminal control	0	1	1	1	1	0	0
RS485 Communication	0	0	0	1	1	1	1

Note: In the above form,"1"is allowing,"0"is forbidding. For example, If you press keypad "RUN", and meet **"Error 14"**, please set "**Fb**=0". And then soft starter can be run by keypad.

If the "External Control" is allowing, you must contact a normally closed switch button between the terminal ⑧ and terminal ⑩, otherwise the soft starter can't start-up the motor and show "**Error 14**".

The parameter**"FE"**is use to set the way of③&④ programmable relay output, As the following form:

Numerical Value of FE	The momentof programmable relay output
0(10)	When sending the order of starting , the program output
1(11)	When beginning to start , the program output
2(12)	When at the start of bypass operation, the program output
3(13)	When sending the order of stopping, the program output
4(14)	When finishing the operation of stopping, the program output

If users need programmable relay output timedelay, the time can be set by parameter**"F4"**.

- When the**"FE"** is set as 5~9(or 15~19), the terminal ③&④ will display the state of programmable relayoutput, As the following form:

The number set by FE	The state of programmable relay output
5(15)	Error state
6(16)	Working state
7(17)	Ready state
8(18)	Starting state
9(19)	By-pass operation state

- The state of programmable relay output is used to show the working state of soft starter, and under this way, the**"F4"**set delay time is invalid;
- The factory setting of**"FE"** code is "7" showing the ready state of soft starter and at this state the motor can be started up;
- When the **"FE"** code is "5" outputting error state of motor, Terminal ③④ can output fault such as: (Err05, Err06, Err07, Err08, Err12,and Err15). This will not affect the function of ⑤⑥ error output terminals.
- When **"FE"**>9, the programmable output will be "reverse phase output", (Normal open will reverse to normal close).
- When **"FC"**=0, all parameters cannot be revised. And when**"FC"**=1, (F4; F6; Fd; FE; FF; FU) cannot be revised. When **"FC"**=2, all parameters can be revised.
- **"FU"** is motor less load protection, when **"FU"** < 10,the motor less load protection is invalid. The **"FU"**less load protection current range is 10%~90%. And delay time is 5~90 seconds. The ten bits*10% is protection current percentage, the Bits*10 is delay time; the bits=0, the delay time is 5seconds.
  For example: **"FU"**=42, the less load current is 40%, and delay time is 20 seconds.

5.4 Help message and explanation

When the product is not starting or stopping ,or not at the "set" state, you can press "Yes" key and come into Help menu ,then press the "Up"or "Down" key to choose the help message. Please press "Yes" or "Stop" key to return.

Help message Form

Message displayed	Explanation
AC 380	That is the 3-phase power voltage is AC 380V.
05.5-3	That is the specification is AC 380V, 60Hz, 5.5KW.
H1:E05	The fault message Err05 that happened at the last time.
:	:
H9:E00	It says no fault happened.
Uer1.5	It says the software of the products is Ver1.5 ~ 6.5.
Lxxxx	Xxxxx is times of successful soft starting
RUNxx	Xx is last soft starting time
Note: The message H1 ~ H9 displayed means 9 faults records that happened lately.	

6. Protection Functions and Directions

We make our soft starters have all kinds of protection functions to protect the safety of soft starter and the motor. Please choose the correct protection Class and parameters according to your application conditions!

Over-heat protection: When soft starter inside temperature is up to 80°C±5°C, the starter will turn toover-heat protection, when be down to 55 °C, this protection removes.

- Input less-phase protection: The delayed time < 3s
- Output less-phase protection: The delayed time < 3s
- Three-phase unbalance protection: The delayed time < 3s, when the difference of current among three phrases is more than 50% ± 10%, the protection be valid.
- Starting over-current protection time: The diagram of over current 5 times of **F6** set rated working current is just as diagram 6.1.
- Working over-load protection time: The starter will be in inverse time thermal protection on. Base of the Max working current of motor (Set by **F6**), (The diagram 6.1 show)
- Low voltage protection delay time: When power voltage is less than 40%, the protection delayed time < 0.5S; When power voltage is less than 80%, the protection delayed time < 3S.
- Over-voltage protection delay time: When power voltage is more than 140%, the protection delayed time < 0.5S; When power voltage is more than 120%, the protection delayed time < 3S.
- Loads short-circuit protection delay time: The protection delayed time < 0.1S.
- Motor less load protection delay time: The protection range (10% ~ 90%) is set by **FU**; the delayed time is 5~90 seconds. When **FU**< 10, the protection is invalid.

6.1 Protection classes and explanation

According different usage conditions, HSS2/3/4Soft Starter has five protection classes, as following:

0. Basic protection
1. Light-load protection
2. Standard protection
3. Heavy-load protection
4. The superior protection

- Basic protection includes the protection functions of overheat, short circuit, and input default phase protection and prohibit external instantaneous stop terminal. Which is proper urgently startup conditions, such as fire pump.
- The protections of light load, standard and heavy-load have the overall protection function of soft starter. The difference among them is protection level of overload and over current. See the diagram of 6.1.
- Under the superior protection, the soft starter has a higher protection level.

The protection classes and the time of heat protection as (diagram 6.1)

FA code	0:Basic protection	1:Light-load protection			2:Standard protection			3:Heavy-load protection			4:Superior protection			Note
The grade of overload protection	No	2 grade			10 grade			20 grade			10 grade			Standard of IEC60947-4-2
The grade of over-current protection	No	3 Second			15 Second			30 Second			15 Second			The 5 times of **F6** current
Overload drop-away time	The multiple to the rated current	3	4	5	3	4	5	3	4	5	3	4	5	They are the typical values
	Drop-away time (S)	4.5	2.2	1.5	23	12	7.5	46	23	15	23	12	7.5	

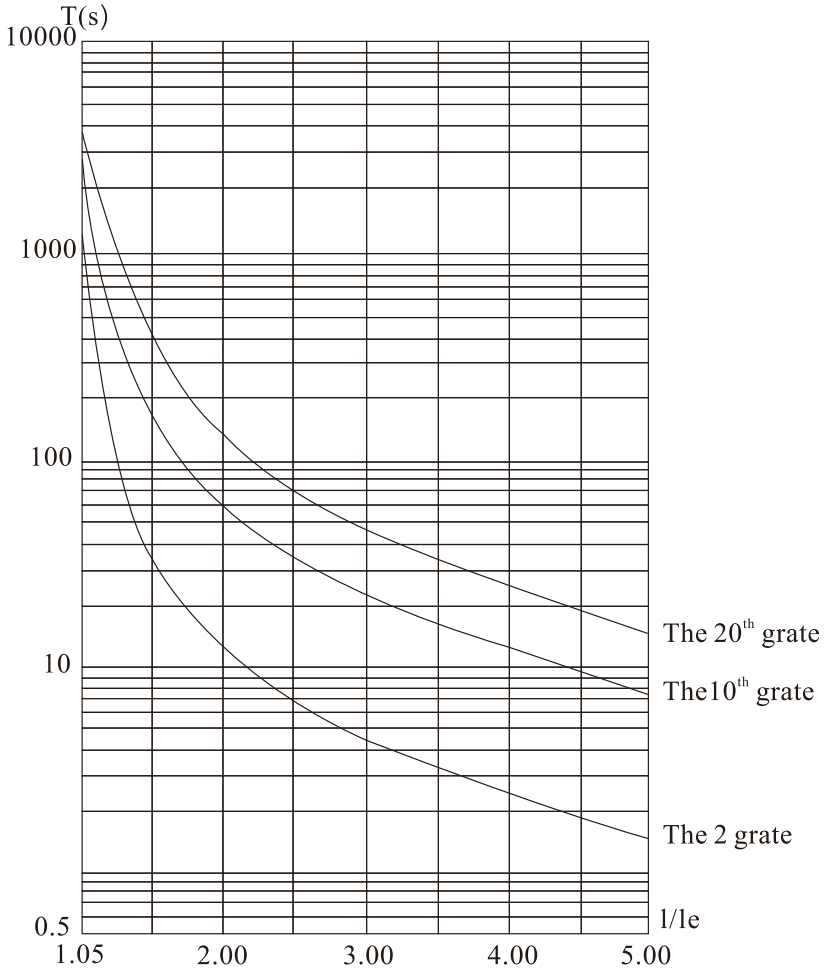


Diagram 6.1 (IEC60947-4-2 standard) Motor heat protection curve (overload drop-away time)

Remark:

- **FP** set value should be same as motor nameplate rated current.
- The **FP** set value should not be less than 20% of soft starter rated current, otherwise the overheat protection will be useless because of big tolerance.

7. Test Run and Application

Please do some examinations before test running as following:

- Whether the rated power of soft starter is matched with the Motor.
- Whether the Insulation of motor meets requirement.
- Whether the main circuit connection of input and output is correct.
- Whether all the screws of terminals are twisted tightly.

7.1 Power on to test running

- **After Power on, please do not disassemble the soft starter cover that is dangerous!**
- Power on, soft starter displays "READY", and the Ready-lamp is light, then you can press "RUN" key to start.
- Set **FP** be same as motor nameplate rated current.
- After started the motor, you should examine whether the motor running direction is correct, or whether runs normally. If not, you can press "STOP" key or cut off the power to stop running.
- If the soft starter starting state is not satisfied. Please see the detailed explanation at 7.2: the starting mode and application
- If the start torque is not enough, you can change the starting voltage (when the starting mode is voltage control) or the certain current value (when the mode is current control) to improve start torque.
- Do not open the face cover in case of electric shock.
- If there is any abnormal voice, smoke or taste, please cut off power as soon as fast, and check the reason.
- When the starter power on or be in starting, the error lamp is lighting and screen displays "Err??", at this time, you can check diagram 7.1 to find out reason .
- Press "STOP" key or external stop button can reset the error state.

Note: When ambient temperature is less than -10℃, the starter should be power on topreheat for 30 minute, and then to start.

Errors and Solution way (Diagram 7.1)

The error display	Explanation	Reason and the solution way
Err00	The fault is removed	Any faults are removed, such as low-voltage, over-voltage, over-heat. Now the Ready-lamp is lighting and you can start the motor
Err01	The external instantaneous stop terminal is open	Please connect the external instantaneous stop terminal (terminal ⑦) with the public terminal (terminal ⑩)
Err02	The soft starter is over hot	The starter is started too frequently, or the starter power is not matched with the motor
Err03	The starting time is over long, which is longer than 60s.	The starting parameter is set wrong, or the load is over and the power capacity is not enough
Err04	Input phase failure	Please check whether the input circuit connections, bypass contactor and the controlled silicon is open or whether the thyristor wire is not connected.
Err05	Output phase-failure	Please check whether the output circuit connection, bypass contactor and the controlled silicon are short circuit, or whether the thyristor wire is connected well.
Err06	Three-phase unbalance	Please check the input three-phase power or the motor

		is abnormal

The error display	Explanation	Reason and the solution way
Err07	Starting over current	Overload, or the motor is not matched with the soft starter
Err08	Running over load	Overload or the **F6** code is set wrong.
Err09	Low voltage	Please check the voltage of input power or the **F7** item is set wrong.
Err 10	Over voltage	Please check the voltage of input power or the **F8** item is set wrong.
Err 11	The parameters are set wrong	Please change the parameter correctly, or you can press the "YES" key to power on the starter again to recovery the factory setting
Err 12	Load short circuit	Check load and the controlled silicon is short circuit or overload
Err 13	The wiring of automatic Re-start is wrong	The external terminals is not connected according the 2-wire way.
Err 14	The wiring of external terminal is wrong	change **Fb**=0,When external control mode is allowing, the external stop terminal is open, and soft starter cannot start
Err 15	Motor less load	Please match the appropriate motor

Note: When the motor starts successfully, the bypass lamp will be lighting that means the bypass contactor is running. At this time, if the contactor is not closed, the motor will stop running, so you can check whether the wiring of the bypass contactor is right.

7.2The starting mode and application

The HSS2/3/4 soft starter has six starting modes for the user to select according the motor and load equipments, as the following:

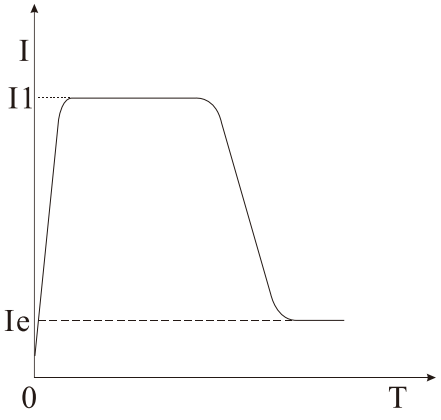


Diagram 7.1

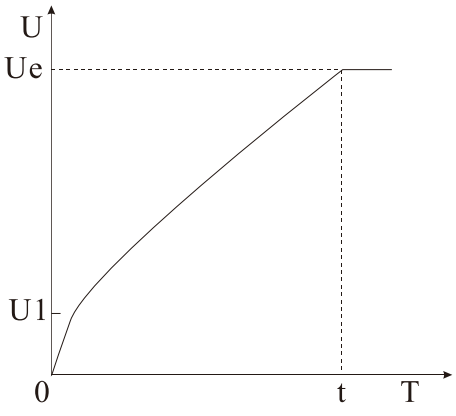


Diagram 7.2

7.2.1 Current-limit to start

(The **F9** code is set as"0") Diagram 7.1shows the waveform of motor current. I1 is the starting limit-current preset value. Whenstarting, the output voltage rises quickly till the motor current up to I1 value and not beyond this value. The motor runs steadily in pace with the rising of output voltage, and when the motor runs to be the rated speed, the output current will have a quick-drop and down to the motor rated current (Ie

value),then the bypass contactor is working, the stating process finished.

Note:When motor load is too light or I1 preset value is too high, the max current of starting may can not reach I1 value. This starting mode fitsfor the conditions whichrequires strict current limit of starting.

7.2.2 Voltage ramp to start

(The **F9**code is set as"1") Diagram 7.2 shows the output voltage waveform. In thediagram, the U1 is the initial voltage value of starting. When starting, if the motor current is not more 400% than the rated current, the output voltage of soft starter will rapidly rise to U1, and the output voltage risesgradually to the rated voltage (Ue), and the motor gradually increase and until running at rated voltage and speed, and then thebypass contactor closed, the starting process finished.

Note:"T"is the automatic detecting starting time according to load. It will be less than set time when the load equipments are light; this starting mode fits for the common occasions where the motor need to be started smoothly.

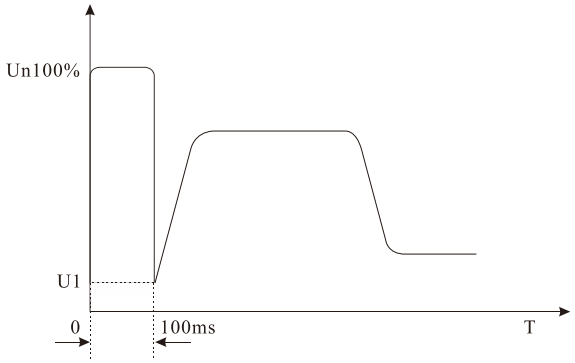


Diagram 7.3

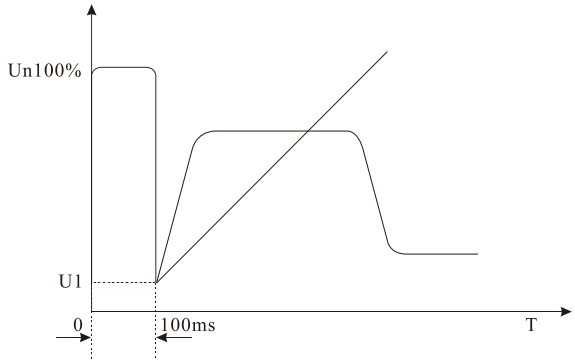


Diagram 7.4

7.2.3 Torque control +current limit or +voltage ramp

(The **F9**code is set as "2"or"3") Diagram 7.3 and 7.4 shows the output changing waveform of torque control starting mode. When the static friction force of heavy load is too stronger to start the motor, user can use this starting mode. At first state of starting, the motor needs a higher voltage to conquer the static friction force of heavy load, and then starts with current-limit or voltage ramp mode to start the heavy motor.

Note：This mode will cause big-current shock to the motor, so if thevoltage ramp or current limit starting mode can startup the motor, it is better not to use this torque control mode to start.

7.2.4 Current ramp to start

(The **F9**code is set as"4") Diagram 7.5 shows the output current waveform. In the diagram I1 is current value preset by **F5** code, and T1 is time value present by **F1** code. This starting mode has very stronger speed-up ability and is suit for the bipolar motors, and it can reduce the starting time.

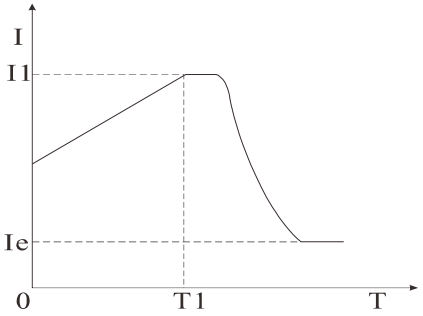


Diagram 7.5

7.2.5 Double closed loop

(Both voltage ramp and current limit)to start (The **F9** items set as"5"). This starting mode uses voltage ramp and current limit double closed loop circuit; it is a composite starting mode. The output voltage waveform is changed as differentmotor and the load equipments. This mode fits for smooth starting and strictly current limit occasions.

7.3 The stopping mode and application

The soft starter has two stopping modes; those are Soft-stopping mode and Free-stopping mode.

7.3.1 Soft-stopping Mode

(The **F2** item is not set as"0") When using this mode to stop the motor, the power supply of motor will be transferred from the bypass contactor to the controlled silicon of soft starter, and the output voltage of starter will be reduced gradually so that the running speed of motor can be cut down smoothly avoidmechanical shock. The output ending voltage is the same as the starting initial voltage. Soft-stopping mode can reduce or remove the surge of the loading equipments such as the water pump.
You can set the soft-stopping current limit value through the **FF**code to reduce the high current shock to the motor when stopping. This current limit value is percentage of **F5**.

7.3.2 Free-stopping Mode

(The **F2**code is set as"0")When using this mode to stop the motor, the soft starter will cut off the connection to the bypass contactor and forbid the controlled silicon output voltage after receiving stopping command. The motor stops gradually with its inertia. One soft start connecting with two motors must use this free stopping mode. Generally, if the softstopping mode is not necessary, please choose the freestopping mode to prolong the service life of soft starter. This mode completely forbids the instantaneous output; avoid instantaneous high current shock to the motor of specially applying.

7.4 Application examples

The parameters of the different loads are different, please refer todiagram 7.2.

The loading	Voltage ramp starting time(s)	Voltage ramp stopping time(s)	Initial voltage	Voltage ramp (current limit)	Current limit to start
Ball mill machine	20	6	60%	400%	350%
Fan	26	4	30%	400%	350%
Centrifugal	16	20	40%	400%	250%
Piston compressor	16	4	40%	400%	300%
Lift	16	10	60%	400%	350%
Stirring machine	16	2	50%	400%	300%
Breaker	16	10	50%	400%	350%
Screw compressor	16	2	40%	400%	300%
Rotating conveyor	20	10	40%	400%	200%
Light load	16	2	30%	400%	300%
Convey belt	20	10	40%	400%	250%
Heat pump	16	20	40%	400%	300%

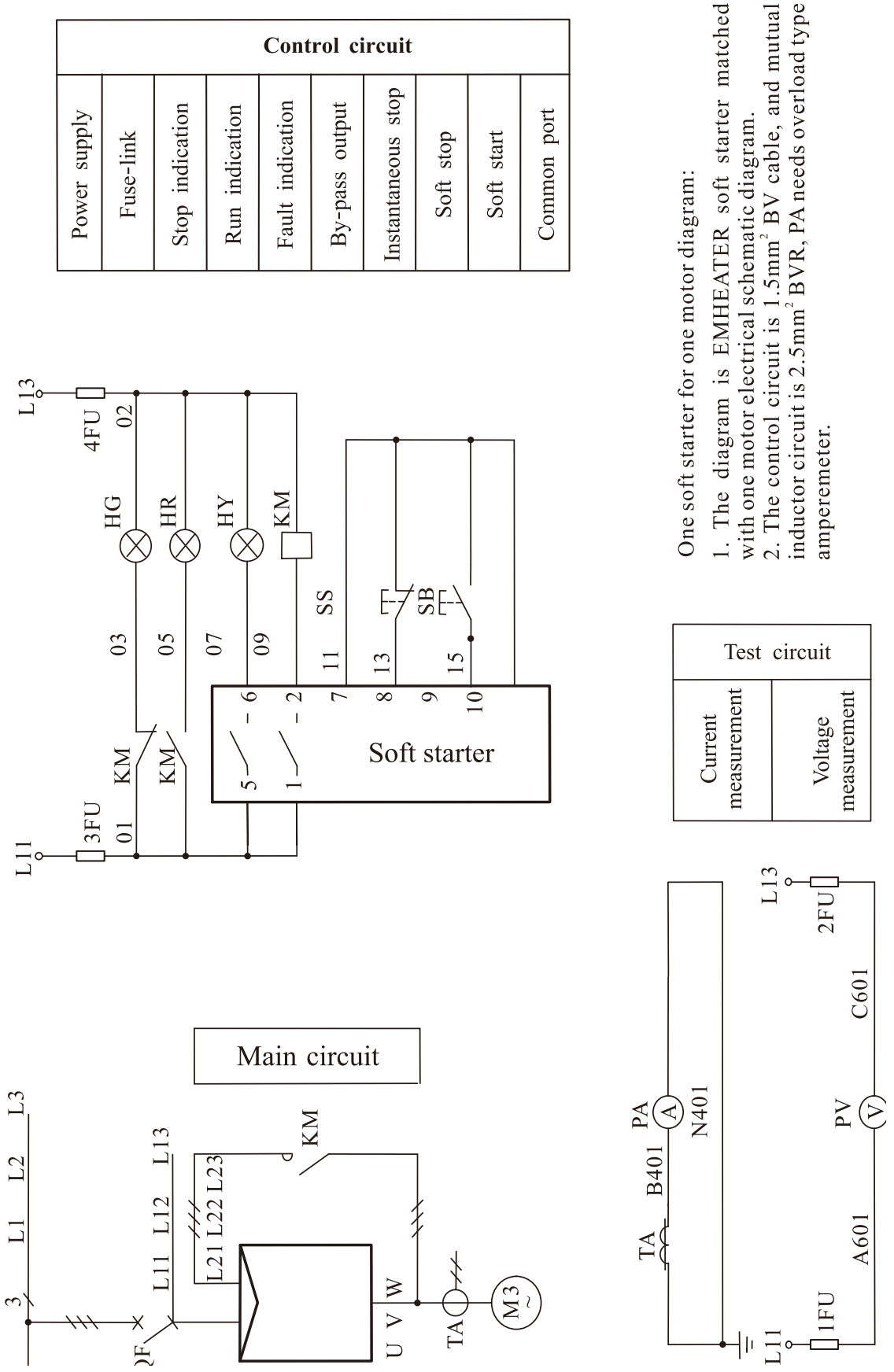
Appendix Ⅰ

The soft start (5.5KW~600KW) selection list of peripheral appliances are as follows:

Model	Rated power (KW)	Rated current (A)	Breaker (A)	By-pass contactor(A)	Cable size (mm^2)
HSSG3-5d5	5.5	11	16	16	4 mm^2
HSSG3-7d5	7.5	15	20	16	4 mm^2
HSSG3-011	11	22	32	25	6 mm^2
HSSG3-015	15	30	40	40	10 mm^2
HSSG3-018	18	37	50	40	10 mm^2
HSSG3-022	22	43	63	63	16 mm^2
HSSG3-030	30	60	80	63	25 mm^2
HSSG3-037	37	75	100	100	35 mm^2
HSSG3-045	45	90	125	100	35 mm^2
HSSG3-055	55	110	160	160	35 mm^2
HSSG3-075	75	150	180	160	30×3 mm^2
HSSG3-090	90	180	225	250	30×3 mm^2
HSSG3-115	115	230	315	250	30×3 mm^2
HSSG3-132	132	264	315	400	30×4 mm^2
HSSG3-160	160	320	350	400	30×4 mm^2
HSSG3-185	185	370	400	400	30×4 mm^2
HSSG3-200	200	400	400	400	50×5 mm^2
HSSG3-250	250	500	630	630	50×5 mm^2
HSSG3-280	280	560	630	630	50×5 mm^2
HSSG3-320	320	640	630	630	50×5 mm^2
HSSG3-355	355	710	1000	1000	60×6 mm^2
HSSG3-400	400	800	1000	1000	60×6 mm^2
HSSG3-450	450	900	1000	1000	60×6 mm^2
HSSG3-500	500	1000	1250	1000	80×6 mm^2
HSSG3-600	600	1200	1600	1600	80×6 mm^2

Note: The rated power and rated current indicate the maximum rated value of the softstart.The matching specification of breakers and bypass contactors should match with the motor.

Appendix II



One soft starter for one motor diagram:

1. The diagram is EMHEATER soft starter matched with one motor electrical schematic diagram.
2. The control circuit is 1.5mm^2 BV cable, and mutual inductor circuit is 2.5mm^2 BVR, PA needs overload type amperemeter.

One soft starter for Two motors diagram:

1. The diagram is EMHEATER soft starter matched with one motor electrical schematic diagram.
2. one soft starter to drive two motors.
3. each motor can separately soft start, and regardless of the sequence.
4. soft starter must be controlled by terminals.
5. two operation time interval must be over 60 seconds.

The soft starter control terminal description:

1, 2 - the bypass relay terminal.

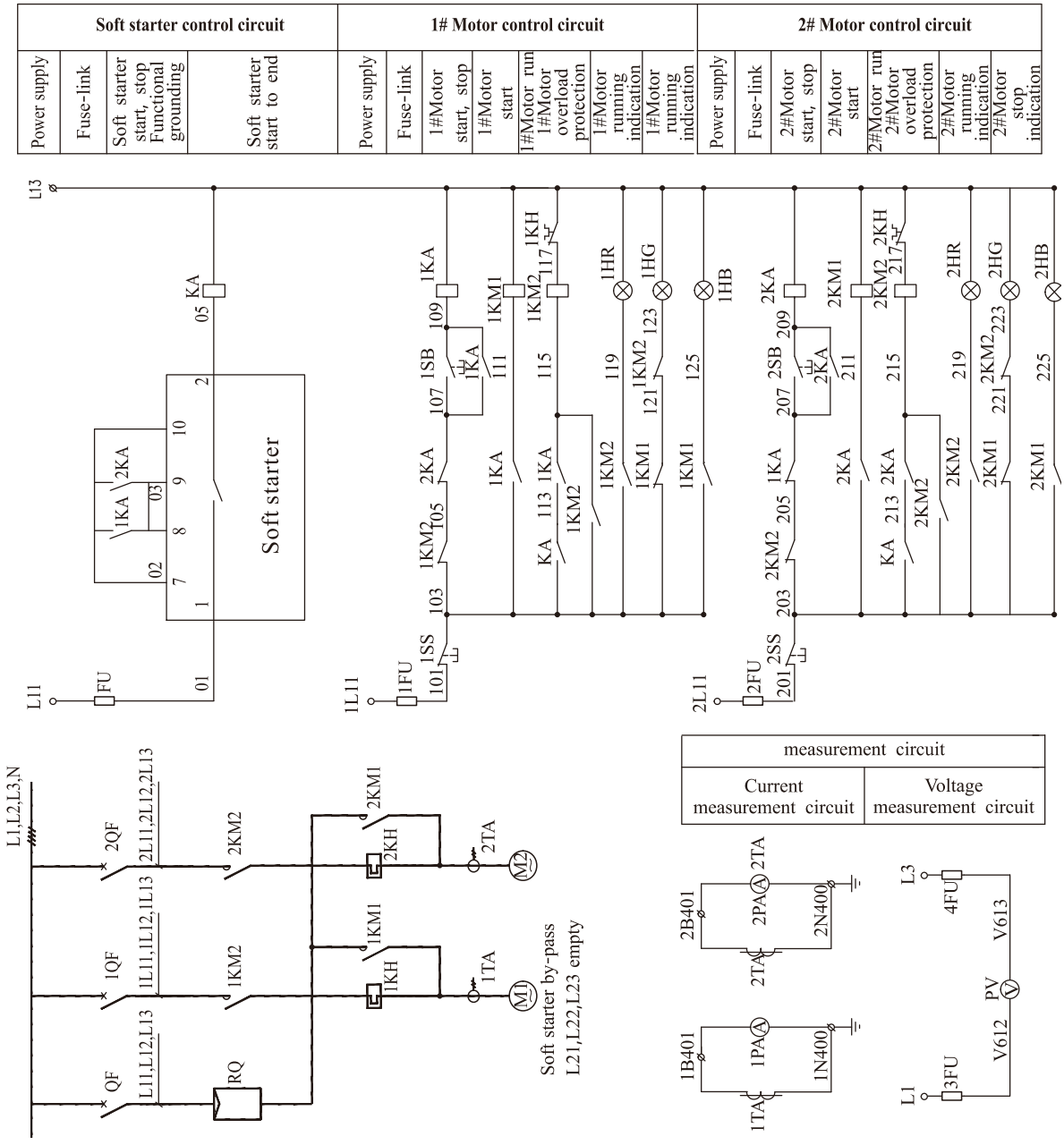
5, 6 - fault output terminals.

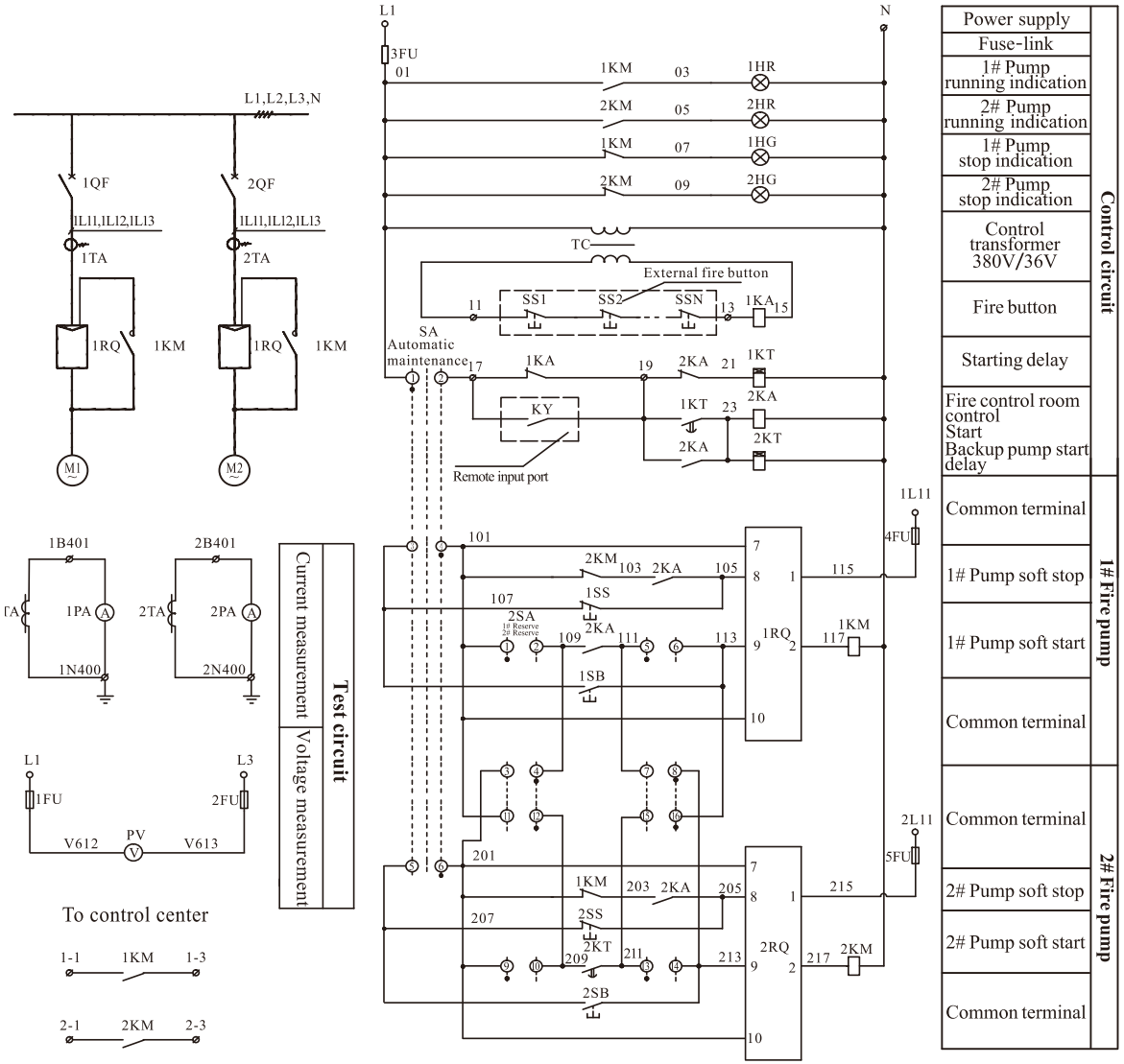
7 - instantaneous stop input terminal.

8 - soft stop input terminal.

9 - soft start input terminal.

10 - common contact input terminal.





One fire pump is working and another is as backup fire pump control diagram:

1. The control circuit is 1.5mm2BV cable, and mutual inductor circuit is 2.5mm2BVR,
2. The SA switches to automatically when two fire pumps one is working and one backup, two pump mutually backup. When one pump is fault, the backup pump automatically put into immediately. SA switches to manually, both pumps manual and separate operation;
3. fault automatic reset;
4. KY is for fire control room control contact point;
5. SS1~SSn are for external fire buttons;

The soft starter control terminal description:

1, 2 - the bypass relay terminal.

5, 6 - fault output terminals.

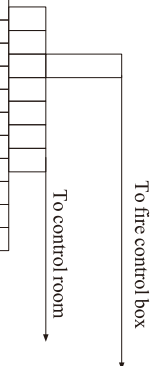
7 - instantaneous stop input terminal.

8 - soft stop input terminal.

9 - soft start input terminal.

10 - common contact input terminal.

JX			
1TA-1	1	1B401	
1PA-2		1N400	
1TA-1		2N401	
1PA-2		2N400	
TC	5	11	SS1
1KA		13	SSn
SA-2		17	KY
2KA		19	KY
1KM		1-1	
1KM	10	1-3	
2KM		2-1	
2KM		2-3	
	15		



Quality Warranty

The warranty of soft starter is as follows:

(1) Warranty period under normal conditions.

We provide guarantees for repair and replacement in 3 months from the date of use.

We provide guarantee for repair in 12 months from the date of use or 18 months fromthe date of ex-factory.

(2) The purchaser enjoys life-long paid service whenever and wherever he uses a motorsoft starter made in our company.

(3) Service in the following cases, even within the warranty period, shall be charged tothe purchaser:

Problems caused by mal-operation in violation of this manual, or caused by unauthorizedrepair or renovation.

Problems caused by improper use of soft starter that is off standard and requirement;

Malfunction or damage caused by improper transit or storage after purchase;

Induced failure or aging of the device due to poor ambient;

Malfunction or damage caused by fire, flood, thunder, earthquake, abnormal voltageor other natural disasters;

Unidentifiable nameplate, mark and ORD number due to intentional spoilage;

Delayed or unsatisfied payment in violation of purchase appointment;

Fail to give an objective description on the use of installation, wiring, operation,maintenance or else;

(4) Defective products should be sent to us for repair, replacement and return, whichcan be proceeded only after verifying the burden of liability.

(5) In case there is any quality problem or accident, we merely promise to bear theabove-mentioned responsibilities. If a user needs more guarantees for liabilities,please assure on the insurance company voluntarily.

Warranty Bill

User company name:			
Website:			
Address:			
Tel:		Purchase date:	
Fax:		Product model:	
Contact person:		Products' code:	
Equipment:		Matched Motor	
Remark:			